

EXHIBIT D

Coatings Encyclopedic Dictionary

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flashoff zone the area within the plant where SOLVENTS EVAPORATE from a coating during the interval between coats or before the painted object enters the bake oven.^{164,172} [EPA] See FLASHOFF,⁵⁴ FLASHOFF TIME,^{54,55} and FLASH DRYING.^{54,55}

flat (verb) See FLATTING DOWN, and RUBBING.^{54,158}

flat see GLOSS.⁴³ Syn: matte, velvet

flat coat coat of FILLER (British) also incorrectly used when meaning prime coat under ENAMEL.⁷¹ (DAC)
*The preferred term is "ENAMEL UNDERCOATER."*⁷¹
An INTERMEDIATE coat of paint used as a BASE for a TOPCOAT.

flat enamel PIGMENTED COATING of low SPECULAR GLOSS, which has the leveling characteristics of a gloss ENAMEL.^{43,71} See ENAMEL.^{43,71}
Enamel has the connotation of both gloss and FLOW.

flat finish see FLAT PAINT (FINISH).^{43,71}

flat grain WOOD OR VENEER SO SAWED that the annual rings form an angle of less than 45° with the surface of the piece.¹⁵³ (ASTM)

flat lacquer a LACQUER with the appearance of having been rubbed after it has dried.¹⁵¹

flat paint brush see FLAT WALL BRUSH.⁵⁹

flat paint (finish) paint which dries to a surface which scatters the light falling on it, so as to be substantially free from GLOSS OR SHEEN.^{43,71} See MATTE FINISH.^{43,71,69} Syn: flat finish

flat screen printer a SEMICONTINUOUS PROCESS for PRINTING ON FABRIC.^{131,148,77,81} (EPA) See SILK-SCREENING.^{77,81,148}

The fabric is placed on a belt, the belt and fabric are moved into position under the flat screen, and the belt is stopped. The flat screen, on which print paste has been applied, is mechanically lowered onto the fabric. A squeegee moves across the screen forcing print paste through a pattern onto the fabric. The screen is then raised and the fabrics and belt are indexed to the next position to receive another screen and another color on the pattern.

flat spot an imperfection on a glossy painted surface; a spot lacking GLOSS, usually caused by a porous spot on the UNDERCOAT.^{42,56} (DAC)

flat stone mill type of GRINDING MILL in which the material to be disintegrated is fed between the grinding surfaces of two flat stones, one of which is caused to rotate.^{49,59,64}

The grinding surfaces are specially prepared with grooves or channels. These mills were used for either dry or wet grinding.

flat varnish VARNISH formulated with a FLATTING agent so as to dry with a dull FINISH. (Not to be confused with a flattening or rubbing varnish).^{58,71,152} Syn: matte varnish

flat wall brush a paint BRUSH, usually 4 to 6 in. (10 to 15 cm) in width, with long, stiff BRISTLES, usually made of synthetic fiber.⁵⁹ (DAC) Syn: flat paint brush

flattening agent see FLATTING AGENT.⁵⁸

flattening agent any material which, when added to a coating or PLASTIC, lowers the GLOSS of the final surface.^{58,83} See FLATTING PIGMENT.^{58,41}

flattening down cutting or RUBBING down the SURFACE of a paint or VARNISH with fine ABRASIVES to produce a smooth, dull surface.^{54,158} (BSI)

flattening oil a VARNISH-like composition made of heavy-bodied oil dissolved in a THINNER, used to reduce paste paint to a FLAT paint.^{63,152}

flattening or flattening (1) undesirable loss of GLOSS during DRYING; (2) addition of a FLATTING PIGMENT or agent to a paint or VARNISH; (3) addition of a FLATTING OIL to a paint or ENAMEL.^{54,56}

flattening pigment any finely divided PARTICLE added to a paint formulation in order to decrease the GLOSS of the dried film. It may be an EXTENDER-type (low REFRACTIVE INDEX) or a HIDING pigment, and it is generally nonchromatic (neutral near-white), although not necessarily so.^{41,58} See EXTENDER (PIGMENT), and DRY-HIDING.^{4143,55}

The reduction in gloss comes about from surface-light scattering which occurs when light strikes the pigments protruding at the surface.

flattening (rubbing) varnish VARNISH containing a high proportion of hard RESIN which can be rubbed down after APPLICATION, to produce a smooth foundation for a finishing coat, or serve as the FINISH coat itself. (Not to be confused with a FLAT VARNISH).^{54,71,152,158} Syn: rubbing varnish, and polishing varnish

fleshing see FLUSHING.^{41,131}

flex-cracking development of small CRACKS in FLEXIBLE articles or coatings when these articles are subjected to repeated flexing or bending.^{42,47,56}

flexibility degree to which a coating after DRYING is able to conform to movement or deformation of its supporting surface, without CRACKING OR FLAKING.^{47,157} See IMPACT RESISTANCE.^{47,157,72}

ASTM test methods for flexibility include: impact resistance, D2794; mandrel bend test, D522; on prepainted metal sheets, D4145. ASTM Test Method D2794 covers a procedure for rap-

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Numerical superscripts classify terms in one or more of the categories listed in the second section of this volume.

calcareous any material containing calcium or calcium compounds.¹³⁴

calcicoater (1) VEGETABLE OIL product that has been reacted with LIME to form a heavy gel-like soap, which has almost infinite tolerance for mineral spirits; used in flat wall paints, PRIMERS, and SEALERS;^{71,156} (2) PIGMENTED FLAT PAINTS using such heavy gel-like soap vehicles.⁷¹

calcimine also spelled "kalsomine." Essentially, chalk and glue ready to mix with water. Used as a decoration for interior surfaces. It will not withstand washing. In Britain, it is referred to as powdered distemper.⁷¹

calcination (1) PROCESS of heating or roasting a material to a high temperature, but below its fusing point, to cause it to lose moisture or other volatile material or to be oxidized or reduced. Originally a heat process for the production of LIME (CaO) from limestone;¹³¹ (2) the process of subjecting a sorptive mineral to prolonged heating at fairly high temperature, resulting in the removal of water, and an increase in the HARDNESS, physical stability, and absorbent properties of the material.¹³¹ (ASTM)

calcined clay CHINA CLAY (KAOLIN) that has been heated until the combined water is removed and the plastic character of the clay is destroyed. This produces an air-solid interface within the particle which increases hiding in the resulting coating.^{41,58,131}

calcite naturally occurring form of CALCIUM CARBONATE. It is an essential material of LIMESTONE, marble, and CHALK.^{41,58}

calcium carbonate, natural CaCO_3 , $\text{CaMg}(\text{CO}_3)_2$. Pigment White 18 (77220). White EXTENDER PIGMENT derived from natural CHALK, LIMESTONE, or DOLOMITE, consisting of CALCIUM CARBONATE with up to about 44% MAGNESIUM CARBONATE.^{41,58} Syn: calcite, limestone, whiting, marble flour, Paris white, chalk, ground oyster shells, Iceland spar, Spanish white. Properties: density, 2.71 g/cm³ (22.6 lb/gal); O.A., 6-15; particle size, 1.5-12 μm . The ASTM specification for calcium carbonate is D1199.

calcium carbonate, synthetic CaCO_3 . Pigment White 18 (77220). CALCIUM CARBONATE manufactured by a PRECIPITATION PROCESS in order to obtain a finer or more uniform particle size range. Four commercial processes are known.^{41,58} Syn: precipitated calcium carbonate.

Properties: density, 2.65 g/cm³ (22.07 lb/gal); O.A., 28-58; particle size, 0.6 to 3.0 μm .

calcium chloride CaCl_2 . SALT used in the manufacture of some LAKES and TONERS from ACID DYE-STUFFS, fireproof paints, sizing compounds, wood preservatives, snow melter, and antifreeze.^{83,144}

calcium hydroxide $\text{Ca}(\text{OH})_2$. Used in MORTAR and PLASTER.¹⁴⁴ Syn: slaked lime.

calcium ion stability the RESISTANCE of a LATEX to COAGULATION or FLOCCULATION in the presence of calcium ions.¹⁶¹

Due to the increased concentration of calcium ions in "hard" water and their presence in some PIGMENTS, EXTENDERS, and SUBSTRATES (such as spackled areas, plaster walls, etc.), it is necessary to test latexes for resistance to calcium and other multivalent ions (see BARIUM ION STABILITY). In addition, multivalent ion stability is necessary for latices which are used for cement or other masonry substrate.

calcium linoleate white amorphous POWDER soluble in alcohol and ether; insoluble in water.¹²⁷

Used for waterproofing compounds, emulsifying agents, and as a stabilizer for oleoresinous paints.

calcium lithol red see LITHOL RED.⁴¹

calcium metasilicate see CALCIUM SILICATE, NATURAL.⁴¹

calcium naphthenate calcium salt of naphthenic acids.^{64,74,67}

Used as an auxiliary DRIER, dispersing and stabilizing aid.

calcium octoate calcium salt of 2-ethyl hexoic acid.^{64,74,67}

Used as an auxiliary DRIER, dispersing and stabilizing aid.

calcium oxide CaO .¹⁴⁴ Synonym for LIME or quicklime.

calcium resinate calcium salt of ROSIN used as an auxiliary DRIER and dispersing and stabilizing aid.^{64,74,67}

Commonly known as LIMED ROSIN, which is really rosin, the acidity of which has been substantially neutralized.

calcium silicate, natural CaSiO_3 . It has white color and acicular particles. It is characterized by high FLATTING action, combined with low OIL ABSORPTION, and is used as an EXTENDER in paints, CERAMICS, and PLASTICS.⁴¹ Syn: wollastonite, calcium metasilicate.

Properties: density, 2.9 g/cm³ (24.2 lb/gal); O.A., 25-30; particle size, 7 μm (fine particle grade); hardness (mohs), 4.5.

calcium silicate, synthetic $\text{CaSiO}_3 \cdot n\text{H}_2\text{O}$. EXTENDER PIGMENT with some DRY HIDING OPACITY.^{41,58}

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laketone a TRANSPARENT INK used for extending LETTERPRESS OR LITHOGRAPHIC INKS.¹⁶⁸

lallelantia oil DRYING OIL obtained from the seeds of *Lallelantia iberica*, found in parts of Asia and Europe.⁶³

It has a sp gr of 0.934/20°C, iodine value of 190, and saponification value of 190. Its main constituents are LINOLENIC and linolenic glycerides.

Lambert's law of absorption see BOUGUER'S LAW.⁴³

Lambert's law of reflection the FLUX reflected per unit solid angle is proportional to the cosine of the angle measured from the normal (perpendicular) to the surface.⁴³

If the reflected flux is isotropic, the surface is said to be a perfect Lambertian REFLECTOR or a perfect DIFFUSER.

laminar flow laminar FLOW is the requisite flow type for reliable measurements of VISCOSITY, and under the proper measuring conditions and limits is obtained in capillary-tube and rotational viscometers.^{166,47} Syn: streamline flow or telescopic flow

If the rate of shear is too high, for both PLASTIC and NEWTONIAN systems, TURBULENT FLOW results; if the rate of flow for plastics is too low, PLUG FLOW results.

laminar scale RUST formation in heavy layers.^{66,158}

laminate product made by bonding together two or more layers of material or materials.⁷⁹ (ASTM) See LAMINATION.^{79,131}

laminate, high pressure LAMINATES MOLDED and CURED at pressures not lower than 1000 psi, and commonly in the range of 1200 to 2000 psi.^{38,57}

laminated, cross LAMINATE in which some of the layers of material are oriented at right angles to the remaining layers with respect to the GRAIN or strongest direction in tension.^{57,79} See LAMINATED, PARALLEL.^{57,79}

Balanced construction of the laminations about the center line of the thickness of the laminate is normally assumed.

laminated, parallel LAMINATE in which all the layers of material are oriented approximately parallel with respect to the GRAIN or strongest direction in tension.^{57,79} See LAMINATED, CROSS.^{57,79}

lamination the PROCESS of adhering two WEB SURFACES together to form a single composite.^{79,131} (EPA)

PAPER, FABRIC, FOIL, and PLASTIC film may also be laminated to each other.

lampblack Pigment Black 6 (77266). Black PIGMENT made by burning low-grade heavy OILS or similar

carbonaceous materials with insufficient air, in a closed system of a design that the SOOT can be collected in settling chambers.⁴¹ Syn: Paris black

ASTM test methods for lampblack include: solvent extractable matter, test, D305; specification, D209; lampblack content, test, D305.

landfill (1) a method of solid waste disposal in which refuse is buried between layers of dirt so as to fill in or reclaim low lying ground; (2) a site used for or reclaimed by such disposal. See SANITARY LANDFILL.^{171,172}

lanolin purified wool grease.¹³⁷ See ADEPS LANAE, ANHYDROUS.¹³⁷

lap (1) noun. Region where a coat extends over an adjacent fresh coat. The object of the painter is usually to effect a joint between the two coats without showing the lap;^{42,54,56} (BSI) (2) verb. To place one coat of FINISHING material alongside another, partly extending over it, causing increased thickness where the two coats are present;^{42,54,56} (BSI) (3) to overlap or partly cover one SURFACE with another, as in shingling.⁸² (BSI)

lap joint see JOINT, LAP.^{54,82}

lap siding see CLAPBOARD.^{75,82,153}

lapis lazuli a rich blue semiprecious stone; either used decoratively or ground and powdered for use as an ULTRAMARINE PIGMENT.^{41,148} (DAC)

lapis lazuli blue natural ULTRAMARINE BLUE.⁴¹

lapping time see WET-EDGE TIME.⁵⁵

larch turpentine see VENICE TURPENTINE.¹⁶⁷

lasur (lasure) a SOLVENT OR WATERBORNE interior OR exterior CLEAR COATING FOR WOOD.⁷¹

This is a term used in parts of Europe. It generally refers to a clear coating with some film build as opposed to a penetrating stain type coating.

latent solvent see COSOLVENT.^{164,83}

latex (1) stable DISPERSION of a POLYMERIC substance in an essentially aqueous medium; (2) fine dispersion of RUBBER OR RESIN, natural or SYNTHETIC, in water; the synthetic is made by EMULSION POLYMERIZATION.^{130,155} cf. EMULSION⁶⁰

Strictly speaking, after polymerization, a LATEX is a solid dispersed in water and, therefore, is not an emulsion. Latex and emulsion are often used synonymously in the paint industry. Generally accepted plurals are latices or latexes.

ASTM test methods for latexes include: filter-retained solids content, D5097; guides to test procedures, D4143; nonvolatile content (solids), D4758; unreacted monomer content, D4827, D4747.

precipitation scavenging see SCAVENGING.^{171,172}

precision (reproducibility) the closeness of agreement between the results obtained by applying a given experimental procedure several times under prescribed conditions. The smaller the random part of the experimental errors which affects the results, the more precise is the method.^{157,145,36} (IUPAC)

This term is not to be confused with accuracy which is a measure of the agreement between the true value and the measured value.

precure usually used for a definite controlled state of partial CURE to set up the article for intermediate handling before the final cure.⁶⁷

Seldom used to refer to a defect.

precursor a chemical compound which is released into the atmosphere, undergoes chemical change, and leads to a new (secondary) pollutant, is called a precursor of that species.^{171,172} (IUPAC)

prefabrication primer quick-drying material applied as a thin film to a METAL surface after cleaning, e.g., by a BLAST CLEANING PROCESS, to give protection during the period before and during FABRICATION.^{71,158} (BSI) Syn: shop primer

Prefabrication primers should not interfere seriously with conventional welding operations or give off toxic fumes during such operations.

prehistoric art painting and sculpture produced by artists of the Old, Middle, and New Stone ages.⁸¹ See CAVE PAINTING.⁸¹

The earliest known piece of prehistoric sculpture is the famous "Venus of Willendorf" (Natural History Museum, Vienna), a small fertility image of Paleolithic origin dating around 11,000 B.C.

premature vulcanization uncontrolled CURING or setting up of material before final CURE.^{67,176} See BIN CURE.⁶⁷

premix an admixture of several ingredients designed to be incorporated in a formulation or PROCESS as a group as opposed to individually.^{49,131}

prepared linseed oil in the PRINTING INK industry, LINSEED OIL which has been treated with LITHARGE and other chemicals.^{63,168}

prepasted ADHESIVE applied to the back of WALLCOVERING by the manufacturer.

DIPPING in water before hanging activates the paste.

prepolymer a POLYMER of degree of POLYMERIZATION intermediate between that of the MONOMER or MONOMERS and the final POLYMER.¹³⁰

preservative a biocidal ADDITIVE used to prevent growth of MICROORGANISMS in LATEX and other

waterborne paints that cause spoilage, foul-smelling metabolic products, gassing in the can, and paint viscosity reduction due to ENZYME digestion of cellulosic thickeners.^{83,173} See WOOD PRESERVATIVE COATINGS⁷¹ and IN-CAN PRESERVATIVES.⁸³

press cake a PIGMENT dispersed in water (obtained directly from a FILTER PRESS) in which a water-insoluble RESIN is emulsified.^{41,164}

A SOLVENT-based dispersion is made by breaking this emulsion and removing the water.

pressure FORCE applied over a surface, measured as force per unit area.¹⁴²

pressure marking GLOSSY OR DULL spots which become apparent as a STRIP is uncoiled.^{56,70}

This is usually due to an undercured or soft film. Also can be caused by improper PLASTICIZER balance.

pressure mottling the film distortion or uneven pattern that causes a change of GLOSS and a non-uniform APPEARANCE in the coated surface, as opposed to BLOCKING.⁵⁶ See PRESSURE MARKING.⁵⁶

pressure-sensitive adhesive see ADHESIVE, PRESSURE-SENSITIVE.⁷⁹

When placed on a backing material, it adheres to another surface on contact without WETTING, heating, or adding a CURING AGENT.

pretreatment usually restricted to mean the chemical treatment of unpainted METAL surfaces before painting.¹⁵⁸ (BSI)

pretreatment primer see WASH PRIMER.^{71,158,66}

pretrimmed papers rolls of WALLPAPER from which SELVAGE has been trimmed at factory.¹⁴⁸ Syn: trimmed papers

primary amine value the number of milligrams of potassium hydroxide equivalent to the primary AMINE basicity in 1 g of sample.^{134,157,128} (ASTM)

primary colors three basic colors used to make most other colors by mixture, either ADDITIVE MIXTURE of lights or SUBTRACTIVE MIXTURE of colorants.^{43,69} See PRIMARY COLORS, ADDITIVE; PRIMARY COLORS, CIE; and PRIMARY COLORS, SUBTRACTIVE.^{69,43}

primary colors, additive three colored lights from which all other colors can be matched by ADDITIVE MIXTURE.^{69,43}

The three must be selected so that no one of them can be MATCHED by mixture of the other two. Generally, a red, a green, and a blue are used.

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containing a suspension of titanium hydroxide, with sodium carbonate.⁴¹

The mixed precipitate is washed and calcined.

titanium dioxide, anatase TiO_2 . Pigment White 6 (77891). A high-opacity, bright pigment of the chalking type, used as a prime pigment in paints, RUBBER, PLASTICS.⁴¹ cf. TITANIUM DIOXIDE, RUTILE.⁴¹ Syn: titania

Prepared from the mineral, ilmenite, or rutile ore. Density, 3.8-4.1 g/cm³ (32-34 lb/gal); O.A., 18-30; particle size, 0.3 μm ; refractive index, 2.55.

titanium dioxide, rutile TiO_2 . Pigment White 6 (77891). A high-opacity, bright white pigment, nonchalking type, used as a prime pigment in paints, RUBBER, PLASTICS.⁴¹ cf. TITANIUM OXIDE, ANATASE.⁴¹ Syn: titania

Prepared from the mineral, ilmenite, or rutile ore. Properties: density, 3.9-4.2 g/cm³ (33-35 lb/gal); O.A., 16-48; particle size, 0.2-0.3 μm ; refractive index, 2.76. Titanium dioxide in its rutile crystalline form has an exceptionally high REFRACTIVE INDEX and its OPACITY and TINTING STRENGTH, when finely dispersed, exceed all other white pigments. It is the most widely used white pigment in the paint and coatings industry.

In addition to giving opacity and whiteness to coatings, titanium dioxide absorbs or reflects harmful RADIATION, thereby protecting the SUBSTRATE. In its pure form it can also act as a photoactive CATALYST causing DEGRADATION of the BINDERS, such as ALKIDS, and eventual loss of pigment from the surface—one of the mechanisms of CHALKING. To prevent or reduce this, titanium oxide PARTICLES are coated with, for example, ALUMINA and SILICA. The coating of titanium dioxide is a highly developed process and has resulted in numerous grades intended for specific uses.

titanium greens complex pigments based on CALCINED mixtures of TITANIUM OXIDE or hydroxide with suitable other metallic oxides, carbonates, etc.⁴¹

The other METALLIC COMPOUNDS include those of zinc.

titanium lithopone this was made by mixing a minor proportion of TITANIUM DIOXIDE into LITHOPONE, or possibly by the COPRECIPIATION of the usual lithopone constituents in the presence of titanium hydroxide.⁴¹ Syn: titanated lithopone

The resultant product in the latter case is subjected to controlled CALCINATION.

titanium yellow see NICKEL TITANATE.⁴¹

TLV see THRESHOLD LIMIT VALUE.¹⁷²

TLV-TWA the allowable time-weighted average concentration for a normal eight-hour workday or 40-hour week.¹⁷²

TMXDI abbreviation for TETRAMETHXYLENE DIISOCYANATE.¹⁴¹ cf. HDI, IPDI, MDI, and TDI¹⁴¹

TNO abbreviation for Dutch Organization for Applied Research¹⁷⁴ (Toegepast Natuurwetenschappelyk Onderzoek).

tobacco seed oil seed oil obtained from *Nicotiana tabacum*.⁶³

Considerable divergencies in composition of the oil have been reported. Some types contain as much as 70% LINOLEIC ACID, whereas others contain no linoleic acid and more than 54% of linolenic acid. In consequence, its constants as reported vary considerably. Certain types have excellent DRYING properties, and can replace LINSEED OIL without detriment.

tobias acid intermediate used in the manufacture of DYESTUFFS. 2-naphthylamine-1-sulfonic acid.⁴¹

TOC abbreviation for TOTAL ORGANIC COMPOUND.^{172,152} (EPA)

tocopherols naturally occurring ANTIOXIDANTS in VEGETABLE OILS.^{63,144}

tole (Fr.) painted tinware; today it is done on many surfaces.^{81,148}

tolerance the total range of variation (usually bilateral) permitted for a size, position, or other required quantity; the upper and lower limits between which a DIMENSION must be held.¹⁵⁷ (ASTM)

toluene diisocyanate (TDI) an aromatic ISOCYANATE MONOMER used as an INTERMEDIATE in URETHANE COATINGS.¹⁴¹ See ISOCYANATE RESINS,¹⁶⁷ POLYURETHANES, POLYURETHANE FINISH,⁷¹ and URETHANE COATINGS.⁷¹ cf. HEXAMETHYLENE DIISOCYANATE (HDI), ISOPHORONE DIISOCYANATE (IPDI), DIPHENYLMETHANE DIISOCYANATE (MDI), TETRAMETHXYLENE DIISOCYANATE (TMXDI)¹⁴¹

toluene AROMATIC SOLVENT used in the manufacture of coatings.^{141,164}

The commercial product has: boiling range, 105-112°C; flp, 50°F; vp, 26 mm Hg/30°C. The term "toluol" is still used commercially but is not preferred.

toluene-sulfonamide resins RESINS made by the interaction of toluene sulfonamide and FORMALDEHYDE.¹³⁰

toluidine reds Pigment Red 3 (12120). Series of red DYESTUFFS made by diazotizing 2-nitro-p-toluidine and coupling this with β naphthol under alkaline conditions.⁴¹

By altering the conditions of preparation, reds of different shade, brilliance, strength, etc., are obtained.

ASTM Test Method D970 covers para red and toluidine red pigments (toners) in the dry form commercially known as "pure."

ASTM D475 is the standard specification for